



Deliverable D4.3

**“ACTION PLAN FOR THE IMPROVEMENT OF
THE INFORMATION MANAGEMENT SYSTEM
FOR RELEVANT KNOWLEDGE AND DATA”**

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**Action Plans for Integrated Regional
Monitoring Programmes, Coordinated
Programmes of Measures and Addressing Data
and Knowledge Gaps in Mediterranean Sea**

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EXECUTIVE SUMMARY

One of the main aims of the ActionMed project is to facilitate Member States in the definition of their Programmes of Measures for establishing and maintaining Good Environmental Status (GES) in European Seas. This could not be achieved without a structured and definitive information management system. To improve such a system and for the relevant MSFD knowledge and data for EcAp, this deliverable D4.3 also considers the approaches used by the RSCs.

Through ActionMed project, Mediterranean Member States will be supported in the elaboration of their possible measures at national and regional level and how this gained information could be distributed through the relevant “formal” reporting bodies. Action plans for this are suggested herein, divided into short, mid and long term plans involving also a roadmap for an interoperable information management system.

1. INTRODUCTION

The Marine Strategy Framework Directive 2008/56/EC (MSFD) aims to protect more effectively the marine environment across Europe achieving a Good Environmental Status (GES) of the EU's marine waters by 2020.

The MSFD provides formal reporting requirements on the initial assessment of the marine waters, determination of GES, development of environmental targets and indicators, development of monitoring programmes, and Programme of Measures (PoMs) that should be applied to marine (sub)-regions.

European Member States (MSs) have to report on these topics, respecting deadlines defined for each article in the implementation process.

The European Environment Agency (EEA) for each deadline and each MS has to open an "envelope" in the Reportnet portal. From the technical point of view, the report process obliges the MSs, the competent Authorities of each MS, to upload a number of files containing the information requested. In order to increase the coherence of the information reported, the Marine Strategy Coordination Group (MSCG) has developed reporting packages for each deadline; in the package common file, format for reporting and guidelines on how to use the proposed format are proposed.

Besides the activities of the MSCG, the Joint Research Center and other European institutes have developed a complete set of technical documents and guidelines on how to implement the MSFD following a common approach.

This report discusses various elements related to the exchange of information and data for MSFD purposes and suggests some actions to be undertaken to improve the current situation.

2. REPORTING REQUIREMENTS ON INFORMATION AND DATA

Looking in more detail at the articles of the MSFD, which make mandatory for the MSs to report to the EC, it is relevant to separate and distinguish between **information** and **data**, in order to analyse possible improvements in the data management process.

In the actual phase of the implementation of the MSFD, the MSs have reported in most cases **information** (text report, metadata about monitoring programmes, etc.) and in very few cases raw **data** (i.e. numbers, results of measurement activities, etc.)¹. This difference is underlined in the minutes of the 13th Meeting of Working Group on Data, Information, and Knowledge Exchange (WG DIKE) (7/12/2016).

While implementing the MSFD, MSs shall notify/inform/communicate to EC under:

- Art. 4 Marine regions and subregions;
- Art. 7 Competent authorities;
- Art. 8 Assessment;
- Art. 9 Determination of GES;
- Art. 10 Establishment of environmental targets;
- Art. 11 Monitoring programmes;
- Art. 13 and 14 Programmes of measures and Exceptions.

Reporting under Articles 7, 8, 9, 10, 13 and 14 means report information, while reporting under Articles 4 and 11 means report data.

1 MSFD 2018 REPORTING

The assessment defined in the Art. 12 of MSFD showed that the submitted information was:

- frequently not comparable within the regions;
- missing elements, such as connections with the information submitted under other relevant Directives or policies;
- generally lacking agreed assessment methods for many descriptors, yielding a wide range of outputs;
- regional coordination was insufficient to ensure consistent approaches to these articles.

Based on previous experience, there are various elements for improvement:

- Reporting with more quantitative information where possible (relevant for setting baselines, and avoiding ambiguity in interpretation of the information);
- Easing the reporting process for MSs (fewer fields, automation as far as possible, code lists for the main variables);

¹ <https://www.eionet.europa.eu/reportnet>

- Possibility to link to the assessment reports performed under other relevant instruments (e.g. WFD);
- Possibility to link to the regional assessments reports and indicators performed under the RSCs;
- Reflecting the requirements of the revised GES Decision and MSFD Annex III.

The following figure 1, shows the minimum elements of the proposed 2018 MSFD reporting package (from EEA presentation on “MSFD 2018 reporting: introducing the general approach”²)

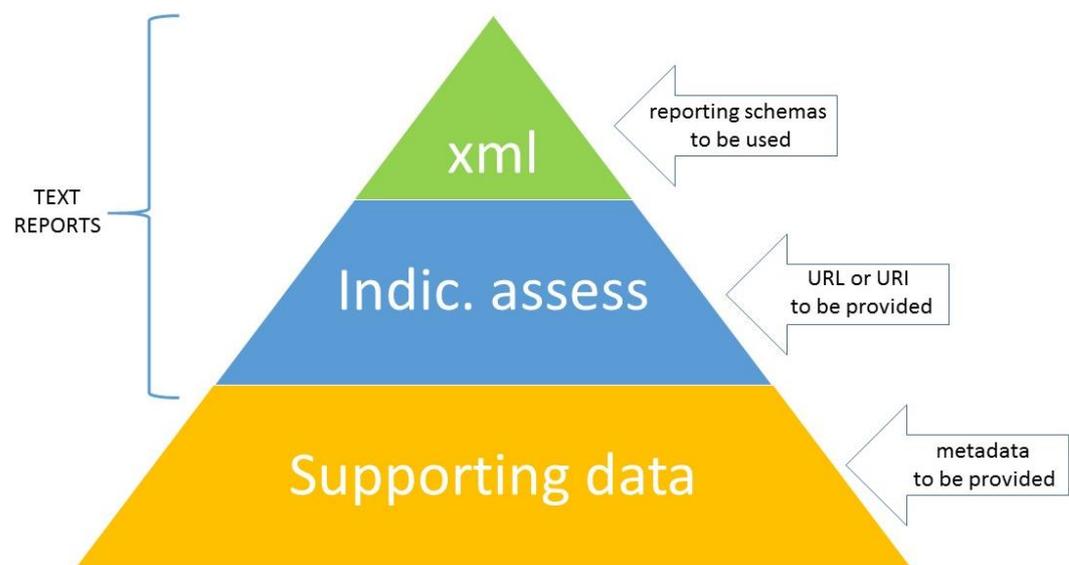


Figure 1: Minimum elements of the proposed 2018 MSFD reporting package (according to EEA).

2 ARTICLE 19.3 AND SEIS

MSFD Article 19.3 is particularly important in the context of this report, stating that the data and information resulting from the initial assessment and from the monitoring programmes should be available, in accordance with the INSPIRE Directive standards and rules, to the European Environment Agency (EEA) and European Commission:

² https://circabc.europa.eu/sd/a/ce051b0b-c948-4ca8-9c07-57ca8ef186d5/DIKE_13-2016-08_MSFD2018reporting_generalApproach.pptx

[...] In accordance with Directive 2007/2/EC, Member States shall provide the Commission, for the performance of its tasks in relation to this Directive, [...] with access and use rights in respect of data and information resulting from the initial assessments made pursuant to Article 8 and from the monitoring programmes established pursuant to Article 11.

[...] such information and data shall also be made available to the European Environment Agency, for the performance of its tasks.

Centralized and decentralized architectures for data management and sharing are based on different principles. The Shared Environmental Information System (SEIS) aims to create an integrated, web-enabled, EU-wide environmental information system by simplifying and modernising existing information systems and processes. It is a decentralized, yet integrated system based on the following principles:

1. Manage information as close as possible to its source;
2. Collect information once and share with others for many purposes;
3. Help public authorities with their legal reporting obligations;
4. Help public authorities to assess the state of the environment and environmental policy effectiveness, and to design new environmental policy if needed;
5. Help make geographical comparisons of the environment;
6. Help citizens to participate in the development and implementation of environmental policy, while making information fully available to them;
7. Use common, free, open standards.

In this framework, a detailed and unambiguous definition of the data flow is extremely relevant to avoid duplicate efforts. ActionMed work within Activity 4 aimed to facilitate this process. A detailed analysis of the existing data and information management systems now in place, with gaps and needs was undertaken. Subsequently, this was completed with an overview of best practices on data interoperability, aiming to draft a list of short, middle and long term actions that could improve data and information flow under MSFD.

3. SERVICE AND PORTAL FOR MSFD DATA AND INFORMATION SHARING

The long-term strategy for activities under Art 19.3, including the use of EMODnet and INSPIRE mechanisms, in support to the implementation of this article, was discussed since 2012 within the Marine Strategy Coordination Group (MSCG) and CIS (see MSCG/11/2013/03) and further within Working Group on Data, Information and Knowledge Exchange (WG DIKE) (see DIKE-7/2013/05).

Making best use of existing mechanisms, including reporting under other EU Directives, the Data Collection Framework, EMODnet, GMES and Regional Sea Conventions is the underlying principle. Within ActionMed, the relationship between EMODnet - INFO/RAC – EIONET has been further investigated and the situation for the Mediterranean area is shown in the following simplified schema (Fig.2):

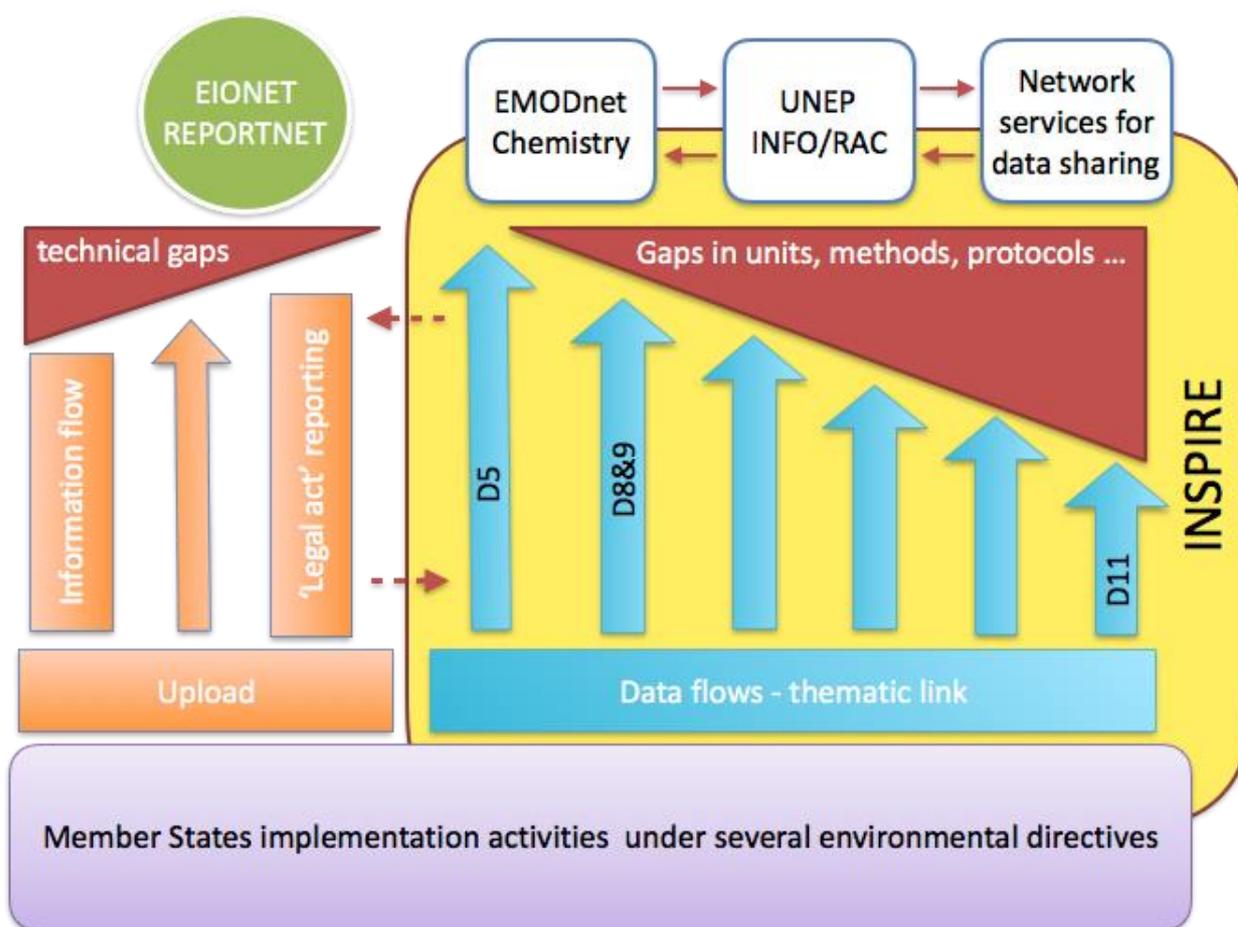


Figure 2: A simplified schema for the relationship between EMODnet-INFO/RAC-EIONET.

Under the framework of the MSFD and various other European Directives (e.g. WFD, HBD, ...), Member States collect and manage information and data inside National repositories or using networks of regional or other administrative and research organizations. From the national level, there are many flows of information exchange that are necessarily interrelated. Oversimplifying, we could anyway identify two main different flows that are directed towards the European/international level.

The first flow relates to the upload of information (reports, summary data sheets, technical documentation) that is required to fulfill legal requirements set up by legal acts and that is collected by EEA in the Eionet's Reportnet infrastructure.

Another flow is related to data that are provided to European Commission, to Regional Sea Conventions and to other domain-related infrastructures (e.g. EMODnet).

All these data should be described, managed and shared using INSPIRE Directive standards and rules as a common framework for sharing data in an open and interoperable way.

In relation with the MSFD anyway, data characterizing different Descriptors have diverse knowledge baselines, standards, collection procedures and so have very different levels of maturity in terms of spatial representativity, completeness, availability, etc.

Both these flows have various gaps that have been identified and that should be addressed to improve information and data availability and reuse for the purposes of MSFD and other environment-related Directives.

4. ACTIONS TO IMPROVE THE FLOW AND MANAGEMENT OF DATA AND INFORMATION UNDER THE MSFD

In the following table (Table 1) the actions are summarized, selected by the Activity 4 of the ActionMed project, to improve the data management under the implementation of the MSFD in the MED region.

The actions are identified by type (coordination, cooperation, technical development, harmonization) and by time frame foreseen for each action (Short, Mid or Long term); Short means by the end of the ActionMed project, Mid is by the second reporting cycle; Long is 2020 and beyond.

Table 1: Summary of actions to improve data management for MSFD in Mediterranean region.

#	Type	Title	Leaders	Time
1	coord	Coordination with INFO/RAC	ActionMed	S
2	coord	Collaboration with JRC INSPIRE Marine pilot and MCC	ActionMed	S
3	coord	Fitness for purpose to report member state monitoring data through EMODnet Chemistry (D5 – D8 – D9)	EMODnet Chemistry	S
4	coop	Development of use cases for regional sea areas, using data and metadata of interest from EMODnet Chemistry	EMODnet Chemistry & UNEP-MAP & BSCS	M
5	tech	Improve the services for the reporting process	EEA/MSCG	M
6	harm	Increase the coherence of the reported information, using the framework proposed by MSCG	MSs	M

7	coord	Facilitate data sharing at regional level (MED) - infoMAP - EMODnet data policy development / agreement	EMODnet Chem & UNEP- MAP(INFO/RAC)	L
8	coop	Share with Info-RAC good practices and tools for data quality control	EMODnet Chemistry & Info- RAC	L
9	harm	Feasibility analysis of adopting EMODnet lots for MSFD descriptors data delivery for straightforward reporting from MS to EU	EMODnet Chemistry & Info- RAC	L
10	tech	Propose and testing specific data flow that can support the programmes of measures and monitoring	EEA & INFO- RAC	L

Note:

Coord: coordinated action,

Coop: cooperative action,

Harm; Harmonisation action,

Tech: technical action,

S: short term,

M: mid term,

L: Long term.

A short description for each action is provided in the following paragraphs.

1 SHORT TERM ACTIONS

1	coord	Coordination with INFO/RAC	ActionMed	S
<p>As a follow up of the first ActionMed workshop, aimed to identify the existing gaps and needs in data and information management infrastructures to support MSFD/EcAp in the MED area and to agree on a list of actions to improve the efficiency of data management and communication, a dedicated joint meeting was organised between EMODnet Chemistry and INFO/RAC.</p> <p>The meeting provided a good opportunity to start to evaluate the interoperability of the two management systems for marine chemical measurements. Data sharing could facilitate further analysis and the dissemination of results provided in cooperation with INFO/RAC.</p>				

2	coord	Collaboration with JRC INSPIRE Marine pilot and MCC	ActionMed	S
<p>The JRC Marine Competence Center (MCC) and the INSPIRE Marine Pilot project are two initiatives led by JRC and related with the MSFD implementation, with particular attention to the data and information management and availability. The Marine Pilot has coordinated experts from EC, EEA and Member States, in order to advance the implementation of INSPIRE requirements, in accordance with MSFD Art. 19.3.</p> <p>The ActionMed project, together with MCC, organised a joint workshop at JRC with the INSPIRE Marine Pilot project to exchange information and update both projects on interoperability of the data management system related to MSFD, taking into account EMODnet approach.</p> <p>The activities and documentation produced by the Working Group on Data, Information, and Knowledge Exchange (WG DIKE) have been particularly important to connect ActionMed activities with ongoing initiatives at European level (EEA, TG DATA, WISE Marine, EMODnet...).</p> <p>In particular, TG DATA will work on building a comprehensive overview of the reporting process and recommendations regarding the implementation of Art. 19.3, in the view of the 2018 reporting.</p> <p>Constant update and possible participation in the activities of WG DIKE and TG DATA would be beneficial for all projects dealing with environmental data management and sharing, in relation with MSFD and INSPIRE Directives.</p>				

3	coord	Fitness for purpose to report member state monitoring data through EMODnet Chemistry (D5 – D8 – D9)	EMODnet Chemistry	s
<p>As a short term action, EMODnet portal, in particular EMODnet Chemistry, is proposed as a data infrastructure to collect and give access to data and aggregated products required for the assessment of Eutrophication (D5), Contaminants (D8) and Contaminants in seafood (D9).</p> <p>In order to improve harmonization of standards for data archiving and management, a thorough comparison with systems in place for OSPAR and HELCOM and managed by ICES have been performed, as well identified needs in relation to MSs reporting on monitoring data have been taken into account. Several actions have been taken to improve the fitness for purpose of the EMODnet infrastructure for the needs of MSFD reporting, as carried out by Member States and Regional Sea Conventions (RSC). These include the extension of metadata, to allow filtering data according to its purpose (monitoring type, research); to identify specific monitoring programs; to select data suitable for inclusion in MSFD reporting based on QA and QC procedures used in collecting it; to facilitate mechanisms for Member States to introduce their data into EMODnet. These extensions reflected on the available data and products services.</p> <p>In 2012, Italy as Member State to accomplish Art. 19.3 reported to EEA row monitoring data related to Eutrophication and Contaminants through EMODnet Chemistry and in particular by providing the link to the Data Discovery and Access Service.</p>				

2 MID TERM ACTIONS

4	coop	Development of use cases for regional sea areas using data and metadata of interest from EMODnet Chemistry	EMODnet Chem & UNEP-MAP & BSCS	M
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EMODnet Chemistry contribution has been requested by UNEP/MAP and by the Black Sea Commission (BSC) for the preparation of the Quality Status Report 2017 (QSR, 2017). BSC requested the access to the regional aggregated and validated datasets (Fig. 3), which resulted from EMODnet Chemistry activity of data collection from more than 30 research institutions and environmental agencies, of regional Quality Control, according to EU standardized procedures and of standardization of data and file formats.

Spatial coverage and plot of Water body nitrate plus nitrite data set

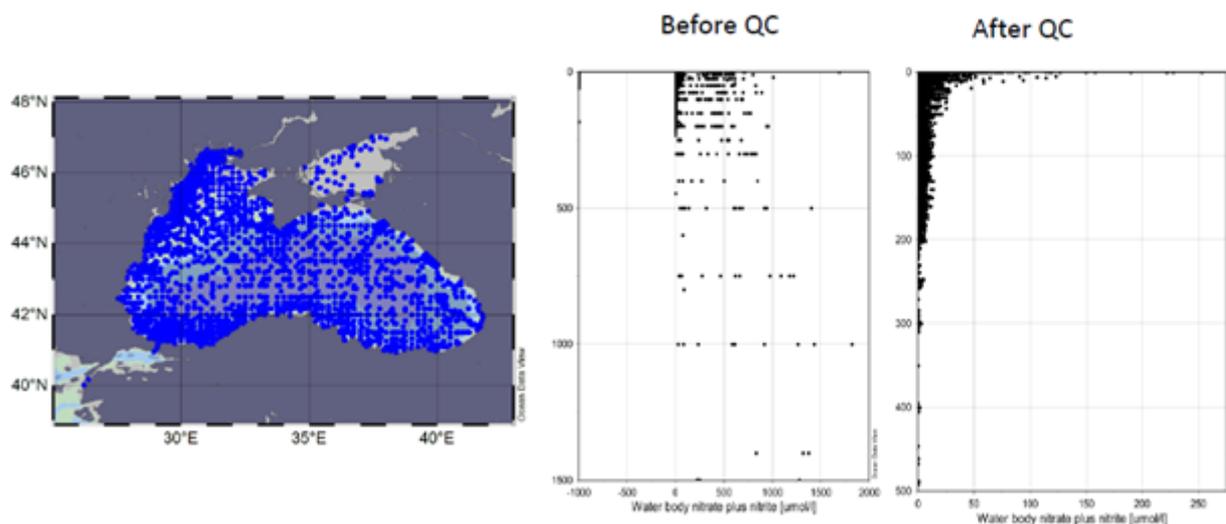


Figure 3: Example of data distribution of nutrients (nitrate plus nitrite) in the Black Sea (left) and comparison between data before and after data Quality Control (right).

UNEP/MAP requested contribution for the preparation of the QSR2017 for the Mediterranean Sea, in particular for the assessment of Eutrophication (Common Indicator 13: Concentration of key nutrients in water column and Common Indicator 14: Chlorophyll-a concentration in water column), as well as of Common Indicator 17: Concentration of key harmful contaminants measured in the relevant matrix (EO9, related to biota, sediment, seawater).

Among the visualization products provided by EMODnet Chemistry, thematic maps of nutrient concentration available for two decades have been proposed as a preliminary use case for data exchange (Fig.4).

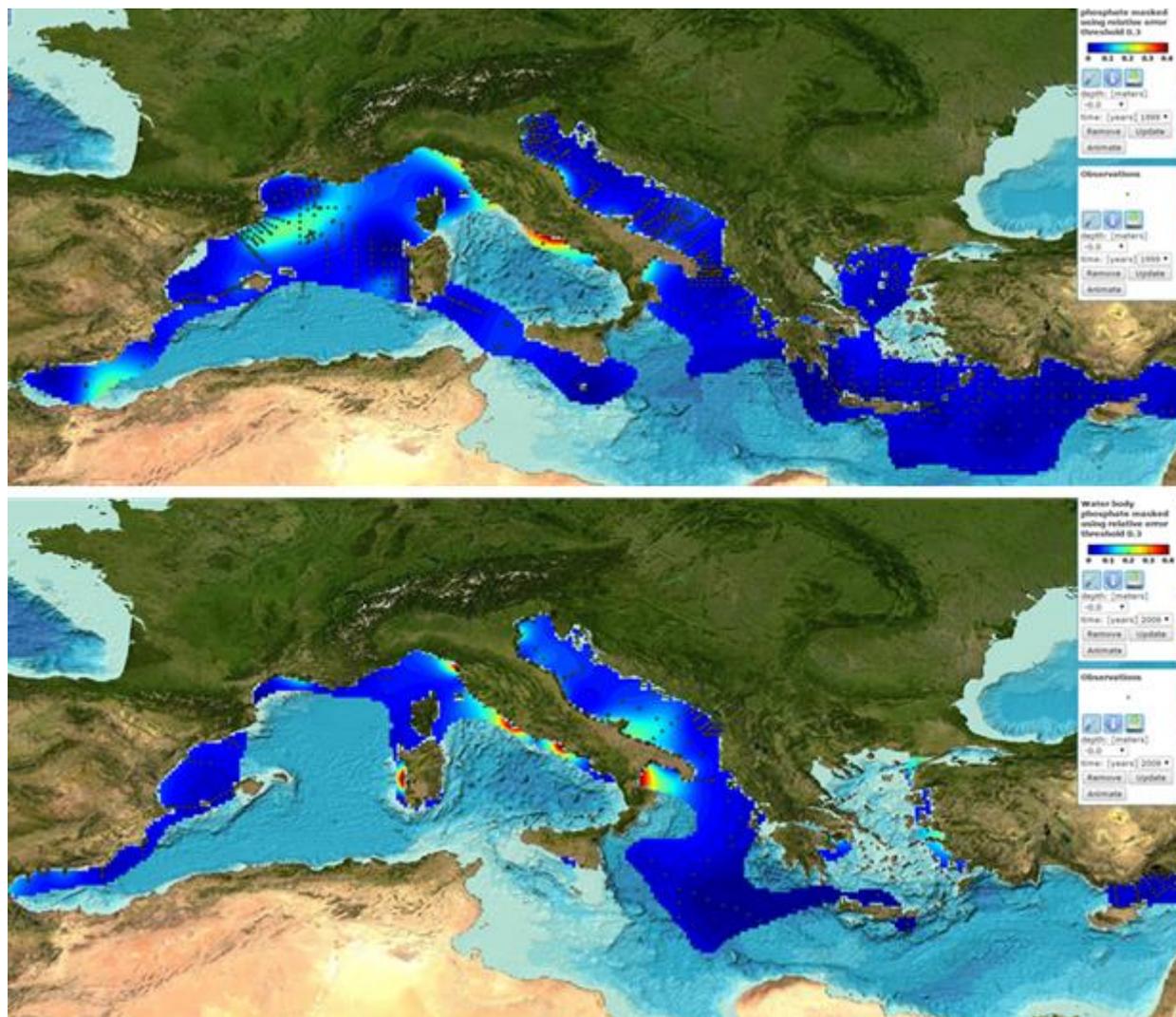


Figure 4: Phosphate, Winter, mean of the 1995-2004 decade (upper panel); Phosphate, Winter, mean of the 2005-2014 decade (lower panel).

5	tech	Improve the services for the reporting process	EEA/MSCG	M
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Based on the assessment related to the Art. 12 of MSFD, some gaps in the reporting procedure were identified and proposals have been suggested by EEA and MSCG to improve it for the 2018 reporting process.

These activities should be agreed among EEA, TG DIKE, TG DATA and MSs and put in place before the start of the 2018 reporting, in order to allow an easier and more efficient collection of information and the subsequent analysis at the aggregated level.

6	harm	Increase the coherence of the reported information using the framework proposed by MSCG	MSs	M
<p>In the first cycle of reporting under Articles 8,9,10 and 11, Member States have submitted a large amount of information, data and in a few cases data from monitoring activities. The information are available on EIONET portal. According to Art. 12, the data used by ActionMed project had to be heavily elaborated to compose the aggregate overview of the status of implementation of MSFD in MED area, in particular the information related to the monitoring programs.</p> <p>To improve the effectiveness of the MSFD there is the necessity to harmonize, among the MED MSs, the reported information. This action aims to increase the awareness of MSs on the guidelines and instruments proposed by the MSCG, WG DIKE and TG DATA, and to stimulate the discussion on how to apply the common indicators and standards developed. The objective is to streamline the outcome of the work of the MSCG and facilitate the discussion at regional and/or sub-regional level, in order to harmonize the reporting process and the coherence of the reported information.</p>				

3 LONG TERM ACTIONS

7	coord	Facilitate data sharing at regional level (MED) - infoMAP - EMODnet data policy development / agreement	EMODnet Chem UNEP/ MAP (INFO/RAC)	L
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The fitness for purpose to report MSs monitoring data through EMODnet Chemistry was discussed as use case within ActionMed project. Data sharing between EMODnet Chemistry and UNEP/MAP, started as a pilot initiative during the project implementation, will be further extended according to MSFD reporting needs. Furthermore, a Memorandum of Understanding between EMODnet Chemistry and UNEP/MAP secretariat is under discussion, to describe the formal terms of the cooperation. Regional aggregated dataset for all MSFD sea basins and data products, specifically relevant for MSFD Descriptors 5 (eutrophication), 8 (chemical pollution) and 9 (contaminants in seafood), are the main outcomes provided by EMODnet Chemistry. The regionally aggregated data, needed to assess Good Environmental Status (GES) according to MSFD, are made available to organizations such as EEA, MSs and RSCs upon request and after agreement with the data providers and used for the Quality status report in the Mediterranean and Black sea.

EMODnet Chemistry data follows SeaDataNet data policy that aims to strike a balance between the rights of investigators and the need for widespread access through the free and unrestricted sharing and exchange of SeaDataNet data, meta-data and data products. The final goal of this policy is to serve the scientific community, public organisations, and environmental agencies, and to facilitate provision of advice and status reports by stating the conditions for data submission, access and use. This policy applies to EMODnet Chemistry data and could be the basis for the development of a joint INFO/MAP - EMODnet data policy.

8	coop	Share with Info-RAC good practices and tools for data quality control	EMODnet Chemistry & INFO/RAC	L
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The quality of the data is a key issue, when merging heterogeneous data coming from different sources, periods and geographic areas. Within EMODnet chemistry community, commonly agreed and standardized data quality control (QC) protocols have been defined (Holdsworth, 2010) to guarantee consistency among comprehensive databases, which include data from different and/or unknown origin and covering long time periods. As a first step, the data are checked and completed by collators with a standard set of metadata that provide the basic

information necessary for their long term use. Afterwards, data undergo a validation loop which consists in several validation steps. As a result, all data are archived with a quality flag value that provides information about their reliability.

The main goal of data quality control is to obtain a validated dataset that could be used to generate homogeneous data products because the errors or anomalies are clearly marked.

EMODnet Chemistry practices and tools for data quality control will be shared with Info-RAC.

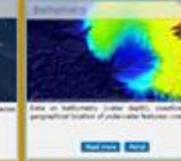
9	harm	Feasibility analysis of adopting EMODnet lots for MSFD descriptors data delivery for straightforward reporting from MS to EU	EMODnet Chemistry & INFO/RAC	L
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By 2018, TG DATA will have to discuss and provide guidelines on data provision according to Article 19.3 through EMODnet. RSCs (and INFO/RAC for the Mediterranean sea) will have an active role in data transmission.

Within this context, we underline the importance to strengthen the communication between INFO/RAC and EMODnet to endorse the adoption of EMODnet Chemistry for raw data management for eutrophication and contaminants in the Mediterranean area, to be followed by other thematic lots, as well.

The EMODnet infrastructure aims to provide a single access point to European marine data and to develop data products specifically relevant for Marine Strategy Framework Directive. The different EMODnet thematic lots manage data related to most MSFD GES descriptors, as detailed in the table (Table 2) below:

Table 2: Relationship between MSFD GES descriptors and EMODnet thematic data portals.

1. Biological diversity				
2. Non-indigenous species 3. Commercial fish 4. Food webs				
5. Eutrophication	 			
6. Sea-floor integrity				
7. Hydrographical conditions	 			
8. Contaminants and pollution effects 9. Contaminants in fish and other seafood 10. Marine litter				
11. Underwater noise/energy (human pressures)				

As a short term action, EMODnet portal, in particular EMODnet Chemistry, is proposed as a data infrastructure to collect and give access to data and aggregated products required for the assessment of Eutrophication (D5), Contaminants (D8) and Contaminants in seafood (D9).

10	tech	Propose and testing specific data flow that can support the programmes of measures and monitoring	EEA & INFO/RAC	L
<p>The monitoring and reporting activities under the MSFD, and other directives, should make available the data and information to asses where the GES is achieved and which measures are needed to maintain or to improve it. Therefore, starting from the reported data, are developed specific information products that aggregate large amount of “numbers”.</p> <p>These reports, maps, and other kind of data products can be developed using several data sources and following the Shared Environmental Information System, each data source (dataset) can be used many times in different products.</p> <p>Starting from a coherent and homogeneous collection of data, it is possible to activate automated data flows that permit to aggregate the information in an automated way, with a great increase of the efficiency of the process.</p> <p>After the second cycle of the MSFD, long term action, it could be possible to activate and test specific data flows, from different data sources that permit to develop data products in an automated way.</p>				

